International journal of child development and mental health
ISSN 2286-7481 *Vol. 5 No. 2 February – July 2017 (33-39)*

Motor Function and Manual Ability in Children with Cerebral Palsy: A Primary Report

Aye Myint Thu, Thant Thant Aung, Khin Mar Myint, Aye Aye Myint

550 Bedded Children's Hospital, Mandalay, Myanmar
*Corresponding author : thant.thant.aung@gmail.com

Abstract

This descriptive study aims to describe the motor type, topographical distribution and motor function of lower limbs, and the manual ability of upper limbs. Cerebral Palsy (CP) describes a group of disorders in the development of movement and posture in the developing brain. This study was carried out during 2015 on 60 CP children. Multiple sources of assessment were used, including medical records of patients at the Physical Medicine Department in 550 Bedded Mandalay Children's Hospital. Children were grouped according to motor type, topographical pattern, Gross Motor Function Classification System (GMFCS) and Manual Ability Classification System (MACS) scales. During the study period, 60 CP children (29 males and 31 females) aged 4-12 years were observed, with a mean (SD) age of 7.7 (3.7) years. In this study, spastic CP was the most common type (80%) and more specifically, bilateral CP (70%) was more common than unilateral (10%). With respect to the GMFCS classification, level II (30%), and to the MACS classification, level II (38.3%), was the most common. This study is only a hospital based, descriptive study and therefore there are many limitations. We are trying to establish a neuro-clinic, as well as a development clinic, with few resources and man power. This research team is in the first few steps of developing a coordinated, multidisciplinary team to help children with cerebral palsy and developmental delay. The significance of the study results will help to educate the community about the role of early intervention, the earlier the better, for children with cerebral palsy.

Keywords : Cerebral Palsy, Descriptive Study, Motor Function, Manual Ability

Introduction

Cerebral palsy (CP) is a group of disorders in the development of movement and posture, causing activity limitation which is attributed to non-progressive disturbances that occur in the developing fetal or infant brain (Bax, Goldstein, Rosenbaum, Leviton, Paneth & Dan, 2005) CP occurs in about 2 to 2.5 per 1,000 live births worldwide and is the most common childhood neuromuscular condition seen by paediatricians, neurologists, and rehabilitation practitioners, including physiotherapists. CP is more common in under-developed communities with their low levels of medical care and after-care. Improvements in neonatology, or the medical specialty which is involved with treatment of neonates, have helped to reduce the number of babies who develop cerebral palsy, but survival with very low birth weight neonates has increased, and these babies are more likely to have cerebral palsy. (Adebimpe, et al., 2013). Although these clinical syndromes are often not clear, recognition of the dominant motor types and topography has been important for causal pathways, possible prevention, establishing a prognosis and setting management goals. Traditionally, CP has been classified according to motor type, topographical distribution and

functional severity. The Surveillance of CP in Europe (SCPE) has also led to the development of standard definitions and classifications of topography and motor type. SCPE is a network of CP surveys and registers formed in 14 centres in 8 countries across Europe. (Soleimani, Vameghi, Rasssafiane & Fahhimi, 2011). Recent studies on the rehabilitation of children with CP have focused on increasing functionality in their daily activities. (Gunel, Mutlu, Tarsuslu & Livanelioglu, 2008) The most useful classification of CP in recent years is the Gross Motor Function Classification System (GMFCS) which classifies the child's movement ability. (Gunel, Mutlu, Tarsuslu & Livanelioglu, 2008). It was initially published in 1997 and many journal articles have been published regarding its reliability and validity. The GMFCS is a five-level ordinal grading system based on the assessment of self-initiated movement, with emphasis on function during sitting, standing and walking. (Morris & Bartlett, 2004). Unlike the classification of motor type and topography, GMFCS has been shown to be a valid, reliable, stable and clinically relevant method for the classification of motor function in children with CP between the ages of 2 and 12 years. (Morris & Bartlett, 2004). Since the time that GMFCS was first developed, research has required the development of a new classification tool for the upper extremity classification and detection of the manual ability of children. In order to achieve this, the Manual Ability Classification System (MACS) was developed by (Eliasson, Krumlinde-Sundholm, Rösblad, Beckung, Arner, Öhrvall, et al, 2006). (Gunel, Mutlu, Tarsuslu & Livanelioglu, 2008)

The Manual Ability Classification System (MACS) provides a systematic basis for classifying how children with CP, aged 4-18 years, use their hands when handling objects in daily activities. The objects are relevant and age-appropriate for the children, used when they perform tasks such as eating, dressing, playing, drawing or writing. (Eliasson, Krumlinde-Sundholm, Rösblad, Beckung, Arner, Öhrvall, et al, 2006). The five levels in MACS form an ordinal scale, but differences between levels are not necessarily equal, nor are children with cerebral palsy equally distributed across the five levels. (Eliasson, Krumlinde-Sundholm, Rösblad, Beckung, Arner, Öhrvall, et al, 2006). With respect to the MACS classification, level IV (23%), and to the GMFCS classification, level IV (30.5%), was the most common. (Soleimani, Vameghi, Rasssafiane & Fahhimi, 2011). This study aims to describe the level of motor function in lower limbs by using GMFCS, and the level of manual ability of upper limbs by using MACS in children with CP, with respect to motor type and topographic distribution, according to the SCPE definitions.

Objectives

Cerebral Palsy (CP) describes a group of disorders in the development of movement and posture in the developing brain. The main aim of this study was to describe the motor type, topographical distribution and motor function of lower limbs, and the manual ability of upper limbs in children with cerebral palsy.

Methods

The study was performed at the neurology clinic in 550 Bedded MCH every Monday under the supervision of a senior paediatrician. All children fulfilling the inclusion criteria were enrolled. Informed written consent was given by parents or caregivers. Detailed history taking and thorough CNS examination were done and recorded in the proforma including motor type and topographical distribution. The levels of motor function and manual ability were assessed at the physiotherapy unit of 550 Bedded MCH by using GMFCS and MACS respectively . Supportive materials such as gait aids (sticks, crutches and walkers) and wheelchairs were used for lower limb function. MACS level classification was undertaken for eating and drinking

manner by using ordinary spoons and cups, including feeding aids such as modified spoons and cups. To guide the decision process, the supplementary MACS level identification chart was used together with the MACS leaflet.

Motor Function Classification System (GMFCS)

LEVEL	GMFCS
Level I	Walks without restrictions, limitations in more advanced gross motor skills
Level II	Walks without restrictions, limitations walking outdoors and in the community
Level III	Walks with assistive mobility devices, limitations walking outdoors and in the community
Level IV	Self-mobility with limitations, children are transported or use power mobility outdoors and in the community
Level V	Self-mobility is severely limited, even with the use of assistive technology

Manual Ability Classification System (MACS)

Level I	Handles objects easily and successfully
Level II	Handles most objects but with somewhat reduced quality and/or speed of achievement
Level III	Handles objects with difficulty, needs help to prepare and/or modify activities
Level IV	Handles a limited selection of easily managed objects in adapted situations
Level V	Does not handle objects and has very limited ability to perform even simple actions

Results

During the study period, 60 CP children (29 males and 31 females with an overall male: female ratio of 0.93, aged 4-12 years, with a mean SD age of 6.3 years) were assessed. Regarding motor type, 42 children (70%) were bilateral spastic CP, 6 children (10%) were unilateral spastic CP, 3 children (5%) were dyskinetic, 4 children (6.7%) were ataxic and 5 children (8.3%) were mixed type. According to the topographical distribution, the highest proportion of quadriplegic (50%), diplegic (33.4%), hemiplegic (8.3%), triplegic (5%) and monoplegic (3.3%) children were categorized. Regarding severity, Level II in GMFCS classification (30%) and also level II in MACS classification (38.3%) was the most common. The second most common was level IV

in GMFCS classification (28.3%) and also level IV in MACS classification (30%). The remaining cases were distributed rather equally to other levels.

Table 1: Distribution of age, gender, motor type and topographical distribution

	Number	Percent
Age group		
4-8 yrs	48	80%
8-12yrs	12	20%
Gender		
Male	29	48%
Female	31	52%
Motor type		
Unilateral spastic	6	10%
Bilateral spastic	42	70%
Dyskinetic	3	5%
Ataxic(Hypotonic)	4	6.7%
Mixed	5	8.3%
Topographical distribution		
Quadriplegia (Double Hemiplegia)	30	50%
Triplegia	3	5%
Diplegia	20	33.4%
Hemiplegia	5	8.3%
Monoplegia	2	3.3%

Table 2: Distribution of GMFCS and MACS Level in children with cerebral palsy

	Number	Percent
GMFCS Level		
Level I	3	5%
Level II	***18***	***30%***
Level III	15	25%
Level IV	***17***	***28.3%***
Level V	7	11.7%
MACS Level		
Level I	7	11.7%
Level II	23	38.3%
Level III	7	11.7%
Level IV	***18***	***30%***
Level V	5	8.3%

Table 3: Distribution of GMFCS and MACS Level according to different motor types

	Total	GMFCS					MACS				
Motor Type	N (%)	I	II	III	IV	V	I	II	III	IV	V
Unilateral Spastic	6 (10%)	2	4	-	-	-	4	2	-	-	-
Bilateral Spastic	42 (70%)	1	9	11	14	7	-	16	5	16	5
Dyskinetic	3 (5%)	-	2	-	1	-	-	1	1	1	-
Ataxic (Hypotonic)	4 (6.7%)	-	2	1	1	-	2	1	-	1	-
Mixed	5 (8.3%)	-	1	3	1	-	1	3	1	-	-
Total N (%)	60 (100%)	3	18	15	17	7	7	23	7	18	5

Table 4: Distribution of GMFCS and MACS Level according to topographical distributions

		GMFCS					MACS				
Topographical distribution	Total N (%)	I	II	III	IV	V	I	II	III	IV	V
Quadriplegia (Double Hemiplegia)	30 (50%)	1	8	4	14	3	-	6	6	15	3
Triplegia	3 (5%)	-	1	2	-	-	-	3	-	-	-
Diplegia	20(33.4%)	-	4	9	3	4	2	12	1	3	2
Hemiplegia	5 (8.3%)	-	5	-	-	-	3	2	-	-	-
Monoplegia	2 (3.3%)	2	-	-	-	-	2	-	-	-	-
Total N (%)	60 (100%)	3	18	15	17	7	7	23	7	18	5

Conclusions

The best way of classifying children with CP is to use a combination of motor type, topography and gross motor function according to the GMFCS and MACS scales. This study may have implications in guiding prognosis, improving the strategies of physiotherapy intervention, and in counseling families of children with CP.

Discussions

Cerebral palsy is one of the most severe disabilities in childhood and makes heavy demands on health, educational and social services, as well as on the families and children themselves. In recent years, the probability of survival has increased into adulthood. Recognition of the dominant motor types and topography has been important for causal pathways, possible prevention, establishing prognosis, and setting management goals and strategies. Recent studies on the rehabilitation of children with CP have focused on increasing functionality in their daily activities. In addition, the difference in functionality according to different types of CP should be considered.

Recommendations

Our study is a hospital based descriptive study and does not represent the status of children with CP in the community, therefore more

data is needed. Families should be encouraged to help identify children with special needs in the community. Identification at an early stage at community level, followed by referral for assessment and early intervention can promote the gross functional status and manual ability of children with CP. These services must be child centered and based on each child's strength and abilities, as well as his or her next area of growth and development.

Limitations

Researcher statements:

As our study is only a hospital based, descriptive study, there are many limitations. We are trying to establish a neuro-clinic, as well as a development clinic, with few resources and man power. This research team is in the first few steps of developing a coordinated, multidisciplinary team to help children with cerebral palsy and developmental delay.

This study shows that children with cerebral palsy came to the hospital with later functional disabilities, joining the neuro-clinic at a later age. The significance of the study results will help to educate the community about the role of early intervention, the earlier the better, for children with cerebral palsy. The hospital data did not represent the whole extent of our nearby community, which would be helpful for further studies.

References

Obembe, A. O., Johnson, O. E., & Ola, M. C. (2013). Gross motor function in cerebral palsy: the association with age, motor type and topographical distribution. *Nigerian Journal of Medical Rehabilitation,* 16(2).

Bax, M., Goldstein, M., Rosenbaum, P. L., Leviton, A., Paneth, N. & Dan, B. (2005). Executive Committee for the Definition of Cerebral Palsy. *Proposed definition and classification of cerebral palsy,* April 2005.

Dyszuk, E. (2014). Inter- relationships of functional status in children with CP: An Extension. *Health and Rehabilitation Sciences*

Eliasson, A. C., Krumlinde-Sundholm, L., Rösblad, B., Beckung, E., Arner, M., Öhrvall, A. M., & Rosenbaum, P. (2006). The Manual Ability Classification System (MACS) for children with cerebral palsy: scale development and evidence of validity and reliability. *Developmental medicine and child neurology,* 48(7), 549-554.

Gorter, J. W., Rosenbaum, P. L., Hanna, S. E., Palisano, R. J., Bartlett, D. J., Russell, D. J., & Wood, E. (2004). Limb distribution, motor impairment, and functional classification of cerebral palsy. *Developmental medicine and child neurology,* 46(7), 461-467.

Gunel, M. K., Mutlu, A., Tarsuslu, T., & Livanelioglu, A. (2009). Relationship among the Manual Ability Classification System (MACS), the Gross Motor Function Classification System (GMFCS), and the functional status (WeeFIM) in children with spastic cerebral palsy. *European journal of pediatrics,* 168(4), 477-485.

Health Organization (WHO) (2013). International classification of functioning disability and health. Geneva: WHO.

Morris, C., & Bartlett, D. (2004). Gross motor function classification system: impact and utility. *Developmental medicine and child neurology,* 46(1), 60-65.

Palisano, R., Rosenbaum, P., Walter, S., Russell, D., Wood, E., & Galuppi, B. (1997). Development and reliability of a system to classify gross motor function in children with cerebral palsy. *Developmental Medicine & Child Neurology,* 39(4), 214-223.

Rassafiani, M., Akbar Fahimi, N., & Nobakht, Z. (2011). Cerebral palsy: Motor types, gross motor function and associated disorders. *Iranian Rehabilitation Journal,* 9, 21-31.

Surveillance of cerebral palsy in Europe: a collaboration of cerebral palsy surveys and registers. (2000). *Dev Med Child Neurol,* 42(12), 816-24.

Tin-Htun-Naing (2007). Assessment of motor disability in children with cerebral palsy at Yangon Children's Hospital, Yangon. *A dissertation for M.Med.Sc (Paediatrics), Institute of Medicine (I), Yangon.*